

REMARKS/ARGUMENTS

This is responsive to the Final Office Action mailed on January 22, 2009. Applicants respectfully request to re-open the examination of this application by filing a Request For Continued Examination (RCE) with a respective fee. Applicants appreciate the time and consideration provided by the Examiner in reviewing this application and allowance of claims 48 and 49.

In the Office Action the Examiner rejected claim 52 under 35 U.S.C. 101 and 35 U.S.C. 112. Applicants cancel claim 52.

Further, the Examiner rejected Claims 1-47, and 50-53 under 35 U.S.C. 103(a) as unpatentable over Schnack 's "Automatic segmentation..." and Hahn's USPub. No 20030068074 in view of Chung's "Anatomical-driven segmentation of the 3rd and 4th ventricles in MR data".

Applicants amended claims 1, which are now believed to be novel and inventive over the prior art. This is not an admission of or an agreement with the examiner's comments, but the applicants have chosen to restrict the claim in an effort to expedite grant of this application.

Claim 1 has been amended to include the following limitations:

- having multiple regions of interest (ROI) defined within a single image (supported by specification, page 7, line 30; FIG. 1, FIGs 10b and 10 c);
- altering the ROIs based on desired histogram distribution (supported by specification, page 11, lines 23-31; previously presented in claim 6);
- growing ventricular regions in 3D space (supported by specification, page 18, sections 2.5 and 2.5.1, page 19, section 2.5. 3).

In addition, claim 1 has also been amended to introduce limitations previously presented in its preamble into the body of the claim.

Claim 6 has been amended to remove the feature of altering ROIs since this is now incorporated within claim 1. In making these revisions care has been taken that no new matter is introduced and the amended claims are fully supported by the specification as originally filed in the present application.

The applicants respectfully submit that the features of amended claim 1 are novel and inventive for the following reasons. The feature of having multiple regions of interest within a single image is not disclosed in any of Hahn, Schnack, Chung or any combination thereof. However, this is clearly shown in the present application in Figures 1, 10b and 10c. In Figure 1, step 2 defines multiple regions of interest, while step 4 connects the corresponding regions - it is clear that the multiple regions are defined within the same image. This is also shown in Figures 10b and 10c, wherein there are multiple regions of interest (rectangular area A and B) are adjusted for region growing until the regions are connected.

Having multiple ROIs (as opposed to Schnack and Hahn where the entire image is used as the ROI) is inventive because region growing needs to be performed only in the ROIs defined, thus reducing computational complexity and computation time required.

Furthermore, leakage control is improved (smaller regions need to be regrown), specific domain knowledge can be incorporated, growth thresholds tailored to each ROI can be defined, etc (see spec. page 19, section 2.6, page 20, sections 2.6.1-2.6.6).

There is also no mention in the prior art references of altering the ROIs. This should not be confused with using histograms for segmentation. While Schnack does disclose some use of histograms, they are used only for segmentation of the ventricles and not used in the placement of ROIs. The segmentation process uses histograms to identify possible brain features for

extraction. The present application, however, uses histograms to alter the ROIs which identify the regions to grow. The extraction of ventricular information is typically performed only after the regions have been completely grown. Furthermore, in Schnack, it is not possible to use the histogram to place ROIs, because Schnack uses the entire image as the ROI, it does not define ROIs for growing specific portions within each image. There is also nothing in Hahn or Chung which disclose alteration of ROIs. The ability to alter the ROIs based on histogram analysis enables the invention to place ROIs more accurately over the various anatomical structures of the brain more accurately (see for example page 15, section 2.3.1).

The third limitation introduced into claim 1 relates to growing the ventricular regions in 3D space. This is clearly not disclosed in any of the prior art references, which all disclose growing 2D regions. While there seems to be some attempt at simulating some form of 3D growth in Schnack (by growing 2D images slice by slice), this is unlike the present application where growth is done in 3D space (see spec. page 18, section 2.5.1; page 19, section 2.5.3). The applicants submit that this clearly distinguishes the present invention from the prior art.

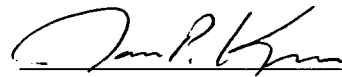
In particular the invention makes it possible to overcome many disadvantages in the prior art. For example, Chun is specifically for segmenting third and fourth ventricles, and uses a Hough transformation to determine the interhemispheric fissure (MSP) and uses edge detection to determine some landmarks, so that region growing can be performed between the landmarks. This has no resemblance to present method, which makes it unnecessary to use Hough transform or edge detection which is sensitive to noise.

Accordingly, Applicants respectfully submit that the cited prior art, alone or in combination do not teach the present invention as claimed in the

independent claim 1 as recently amended, and claim 1 is novel and patentable over the prior art. Applicants maintain that dependent claims 2-47 and 50, 51 and 53 as originally presented and amended by this response are also novel and patentable over the prior art for reasons discussed with reference to the independent claim 1. Therefore, the application is now in condition for allowance, which allowance is earnestly solicited.

The Commissioner is hereby authorized to charge any fees, which may be required in connection with this correspondence, to Deposit Account No. 06-1135.

Respectfully submitted,
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